pose of facilitating the growth of oysters. This consists of a series of shallow flat baskets or trays of wire-netting on an iron frame, about 4 inches deep and 2 feet square, placed in tiers, and held together by two iron bands, the number depending on the depth of water in each case. These are either fixed to the soil, or suspended from rafts or other floating bodies, by which means depths of water otherwise inaccessible can be utilized. The other advantages claimed for the apparatus are economy of space in "planting" oysters, and of labour in collecting them, protection of the oysters from five-fingers, and from contact with unsuitable soil, and their exposure on all sides to the free circulation of the water, resulting in more rapid and regular growth, and a greater tendency to depth of shell than under the most favourable of ordinary circumstances. In the case of beds infested with the boring worm referred to, the trays in question would in all probability afford a ready means of placing the oysters beyond the reach of these marauders. The convenience of such appliances, especially in cases where French oysters are laid down temporarily on English beds, to be afterwards transferred to other grounds, *e.g.* during the winter, would probably be found to be very great.

At a meeting of the Chemical Society held on June 18, a paper was read by Ludwig Mond and F. Quincke, on a volatile compound of iron and carbonic oxide. The authors describe experiments from which they conclude that iron forms a volatile compound with carbonic oxide of the formula $Fe(CO)_4$, corresponding to that of nickel. Very finely divided iron—obtained by reducing iron oxalate by hydrogen at a temperature but little exceeding 400°, and allowing it to cool to 80° in hydrogen—when heated in an atmosphere of carbonic oxide gave a gas which burnt with a yellow flame; and on passing the gas through a heated tube a mirror of iron was formed at between 200° and 380°, while at higher temperatures black flakes of iron and carbon were deposited. Only about 2 grams of iron, however, were volatilized after six weeks' treatment of 12 grams of the metal; it was necessary every five or six hours to interrupt the operation, and to re-heat the iron to 400° in hydrogen during about twenty minutes. When passing carbonic oxide at the rate of about 2½ litres per hour, not more than 0·01 gram of iron was volatilized, corresponding to less than 2 c.c. of the compound $Fe(CO)_4$ in a litre of gas. The authors have effected an analysis of the compound by passing the mixture of gases into mineral oil, boiling between 250° and 300°, and heating the solution so obtained to 180°; iron free from carbon is then deposited and carbonic oxide gas is evolved. Five analyses are quoted, the results of which give a ratio of Fe : CO, varying only from 1 : 4·03 to 1 : 4·264. Dr. Armstrong said that the authors' discovery was extremely interesting on account of the explanation which it might be held to afford of the permeability of iron by carbonic oxide at high temperatures, as well as to the production of steel by the cementation process, to which Graham had drawn special attention. Just as platinum was permeable by hydrogen and silver by oxygen at high temperatures, so iron was permeable by carbonic oxide; it might be supposed, in each case, because a dissociable compound of the metal with the gas was formed. Prof. Thorpe drew attention to the value of the experiments in connection with the production of steel by the cementation process, and stated that he had recently observed that platinum had the property of causing the separation of carbon from carbonic oxide. Mr. Mond said they had refrained from discussing the application of their discovery in the directions indicated, as the compound was only obtained at low temperatures. Dr. Armstrong said this might well be the case; but as Mr. Mond and Dr. Quincke had established the all-important fact that iron had a specific affinity for carbonic oxide, the argument he had used would apply, although the compound might not be sufficiently stable at high temperatures to exist alone.

The additions to the Zoological Society's Gardens during the past week include a Chimpanzee (*Anthropopithecus troglodytes* ♂) from West Africa, presented by Major Al. McDonnell Moore; a Duyker Bok (*Cephalophus mergens* ♂) from South Africa, presented by Mr. A. Barsdorf; five West Indian Agoutis (*Dasyprocta antillensis*) from Jamaica, presented by the Board of Governors of the Institute of Jamaica; a Spotted Cavy (*Cælogenys paca*) from Guiana, presented by Mr. R. Kirk; two Slow Loris (*Nycticebus tardigradus*), a Javan Fish-Owl (*Ketupa javanensis*) from Java, presented by Mr. R. Dixon; an Orange-cheeked Waxbill (*Estrelda melpoda*), a Zebra Waxbill (*Estrelda subflava*) from West Africa, a Nutmeg Finch (*Munia punctularia*) from India, presented by Mrs. Harris; a Chattering Lory (*Lorius garrulus*) from Moluccas, presented by Miss Alice Dundas; a Common Viper (*Vipera berus*), British, presented by Mr. W. H. B. Pain; four Grey Parrots (*Psittacus erithacus*) from East Africa, deposited; a Thar (*Capra jemlaica*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

Luminous Outburst observed on the Sun.—*Comptes rendus* for June 22 contains the information that on June 17, at 10h. 16m. Paris mean time, M. Trouvelot observed a luminous outburst on the sun, apparently of the same character as that witnessed by Carrington and Hodgson in 1859 (*Monthly Notices R.A.S.*, vol. xx. pp. 13–16). A luminous spot subtending an angle of 3° appeared near the western limb of the sun (position-angle 281°). It had not the characteristic white colour of faculæ, but was yellowish, and strikingly resembled the light emitted by incandescent lamps shortly before they reach their maximum brilliancy. M. Trouvelot's first impression was that an opening at the eye-piece allowed a ubiquitous sunbeam to fall upon the screen upon which the sun's image was being projected, but an examination proved that the phenomenon was truly solar. In fact, shortly after the time of the first observation, a similar brilliant object subtending an angle of about 5° or 6° appeared slightly to the north of the first, its position-angle being about 289°. By means of spectroscopic observations it was found that the first object consisted of a central eruption from which a species of incandescent volcanic bombs were thrown to heights of 2′ or 3′ above the chromosphere, where they rested as if suspended, and appeared as dazzling globes on the red background on which they were projected. A few minutes later the sparkling balls were replaced by numerous brilliant filaments or jets, which at 10h. 24m. were shot out to a height of 5′ 24″. In spite of the vivid light of this prominence only a few lines in the spectrum were seen to be reversed. In addition to the lines C, D_3, F, and G, which were all extremely bright, the line at λ 6676·8, the *b* group, and a line about λ 4394·8, were seen bright. The sodium lines, D_1 and D_2, showed no indication of reversal. Considerable displacements of the C line towards both ends of the spectrum were observed. On the following day at 9h. 30m. the eruption was still very apparent, but diminishing in activity, and at 2h. 45m. all signs of an eruptive prominence had disappeared. The striking character of the outburst led M. Trouvelot to suggest that it might be accompanied by a simultaneous terrestrial magnetic perturbation. This was not the case, however, for after examining the records obtained at Kew Observatory, Mr. Whipple writes that there was not the slightest magnetic disturbance on the dates when the eruption was observed.

LORD HARTINGTON ON TECHNICAL EDUCATION.

The fourth annual meeting of the National Association for the Promotion of Technical and Secondary Education took place on Friday last at 14 Dean's Yard, Westminster. Lord Hartington, President of the Association, occupied the chair. He said:—

In opening the proceedings it will be, fortunately, unnecessary for me to trouble you with more than a very few brief observations. It has not been considered necessary to make any attempts to obtain a very large attendance to-day, or to meet in any place where we could have a meeting on the scale of others which we have had on this subject in previous years, not but that we have arrived at a very important epoch in the development of the objects for which this Association was founded four or five years ago. It may, perhaps, be desirable for me, in the first place, to call your attention and the attention of the public to the special objects for which this Association has been founded, as I think there is in some quarters some misapprehension as to the practical nature of the objects which we have in view. As is stated in the report, its object has not been to interfere with the teaching of trades in workshops, or with the industrial and commercial training in the manufactory and in the warehouse. It desires, first of all, to develop increased general dexterity of hand and eye among the young, which may be especially useful to those who have to earn their own livelihood, and at the same time improve rather than hinder their general education; secondly, to bring about more widespread and thorough knowledge of those principles of art and science which underlie much of the industrial work of the nation; and, thirdly, to encourage better secondary instruction generally, which will include more effective teaching of foreign languages and science, for those who have to guide our commercial relations abroad and to develop our interests at home. Now, those are the objects to carry out which this Association was founded. At the time when it was first originated, these objects were very little recognized in any quarter. They were not recognized as in any degree the duties of the State, except to a very limited extent, so far as the operations of the Science and Art Department were concerned. But, useful and valuable as has been the teaching carried on under the guidance and direction of the Science and Art Department up to a very short time ago, I think it may be said that scarcely any attempt had been made to give to that teaching a practical application, or to apply its instruction to the advancement and improvement of the industries of the country. Well, the absence of any State recognition was not to any large extent supplied at that time by private efforts. It is quite true that a few manufacturers in different parts of the country had set the very useful example of establishing, in connection with their works, some technical and scientific teaching. There were also a few institutions, such as the well-known Polytechnic Institution here, others in the City and in various other parts of the country, which were making attempts to give instruction with the objects which I have just enumerated, but those efforts were rather of a philanthropic than of a practical character, and they had not four or five years ago attained a very large or extensive development. Well, we may look back now at those years as years of very great and very satisfactory progress. I will not say all that has been done has been done in consequence of the exertions of this Association. Certainly these objects have been greatly advanced since the foundation of the Association, and, we flatter ourselves, to a certain extent in consequence of the efforts of the Association. But whether the progress that has been made has been in consequence of, or independent of, any exertion of ours, it is equally a matter of congratulation that progress has been made. In the first place, those objects to which I have already referred have been recognized by Parliament as proper objects to receive assistance, by means of public funds, in the shape of the application to them of the rates. By the Technical Instruction Act, which was passed in 1889, mainly at the instance of some active Parliamentary representatives of this Association, that principle was for the first time admitted; but a very much greater step was taken in the next year, 1890, when, under the Local Taxation Act, a sum very nearly approaching £750,000 for England and Wales was placed at the disposal of local authorities, mainly for the objects which this Association has in view. It is quite true that the application of that sum was to a large extent optional. It would have been in the power of local authorities in whose hands it was placed to apply it in aid of the rates or to other purposes, but the efforts of the Association were directed, as I think I shall be able to show you, with very great success, in order to secure the appropriation of these large funds to the purposes of practical technical instruction. You will recollect that in the winter of last year—I think in December—an important conference was held under the direction of the Executive Committee of this Association at the rooms of the Society of Arts, in which members representing County Councils in various parts of the country entered into conference and discussion with the Executive Committee of this Association. Information was given as to what had already been done by certain County Councils which had taken the lead, and suggestions were made as to the manner in which other Councils could most usefully follow their steps and devote these sums to the purposes for which we believe they were intended by Parliament. The results which have already been accomplished are recorded in the report of this Association, which will be immediately circulated. Of County Councils in England, excluding Monmouthshire, 37 have already decided to give the whole of this grant for the purposes of technical instruction; 8 have decided to give a part of this grant for the same purposes, and 2 only have decided to apply the whole of it in aid of the rates. In Wales and Monmouthshire 11 County Councils have given the whole to education, and 2 have given a part to the same purpose. Of the county boroughs in England, 33 have devoted the whole of the funds to educational purposes, and 3 have devoted a part to the same objects. In Wales 2 county boroughs have devoted the whole of the fund to education, and none to any other purposes. With regard to 23 county boroughs, either we have not sufficient information, or they have not yet arrived at a conclusion upon the subject. Well, that appears to us to be an extremely encouraging result so far as it has gone. The exertions of the Executive Committee have not, however, been entirely confined to securing this appropriation of the funds placed at the disposal of the Councils by Parliament. The same gentlemen who have taken the lead in the matter from the beginning—I refer chiefly to my friend Sir Henry Roscoe, Mr. Acland, Mr. Hobhouse, and others—have obtained from Parliament additional legislation considerably extending and developing the principle which for the first time received the assent of Parliament in 1889. I think it is hardly necessary that I should give further information as to the effect of the amending Act of this session. I prefer to leave the gentlemen I have named to give that explanation. But I desire, however, to point out that the work of this Association, which has been so successfully begun, has not by any means yet ended. The application of these grants in the various localities is, of course, a work of great variety and of the utmost importance. Fortunately, I think, the State has not undertaken, except under very wide conditions, to exercise any supervision over the application of these funds. In a country possessing industries of so extremely varied a character as ours, it would have been almost impossible, and I think certainly would have been most undesirable, that any cut-and dried system should be adopted by which one identical, application of public money to purposes of technical instruction should be adopted all over the country. The application of these funds must vary very greatly in agricultural districts, and in agricultural districts themselves as between arable and dairy or cheesemaking districts. It must vary in those districts which are chiefly devoted to cotton and woollen industries, and those which are chiefly employed in the coal-mining, metal, or chemical trades; and in almost every different county of England a different application of those resources would have been required. I think very wide discretion has been very wisely left by Parliament to the local authorities themselves, which are in this instance County Councils or county borough councils. And these Councils have again adopted the wise course of appointing committees to prepare schemes for the approval of the Councils for the application of these grants. The work was, of course, very new to a great many who had to take it up, and this Association has been able, we think, to give valuable assistance to them, both by affording information and giving advice, and, above all, by providing the means of communication between those who are interesting themselves in this work in various parts of the country, to enable them to know what other authorities were doing, what difficulties were found, what means had been found of surmounting those difficulties, and of generally taking counsel and acting together in co-operation. Now, the subject of agricultural education, which up to a very short time ago had been almost entirely neglected, has been by many County Councils vigorously taken up. Courses of instruction in elementary science applying to agricultural pursuits have been instituted, and also instruction of a still more practical character, in the shape of travelling dairies and other instruction of the same kind, has been given in many places. I am glad to say that the two great Universities of Oxford and Cambridge have also turned their attention to this important subject, and both of them are preparing to take steps by which the teachers who will be so much required in order to give effect to the desire of the County Councils to improve the agricultural education of their districts will be provided. I am glad to say also that the important subject of the technical education of girls as well as boys is receiving almost universal attention from County Councils. Suggestions have been made by this Association, which have in most cases received attention, to provide not only for the instruction of the boys, but also of the girls, in such subjects as cookery, laundry-work, and dairy management. In all these matters the Association has been able to give some assistance, and we believe that there remains a great deal still in which they will be able to afford the same nature and description of assistance. I need not say, ladies and gentlemen, that for a very considerable time the work which is likely to be thrown upon this Association will be work which cannot be conducted without considerable financial resources. The income of the Association is not a very large one. We have made an appeal to many of those who throughout the country have interested themselves in this work in connection with County Councils, and we have received very liberal assistance. I think, however, the time has come when we may hope that the efforts which have been made will be to a certain extent, still more than they have hitherto been, supplemented by the assistance of gentlemen connected with the great manufacturing, mining, and commercial industries of the country, who are likely, I think, to derive at least as much benefit from the operations of this Association, and from the development which it has aided in giving technical instruction throughout the country, as the agricultural industry has already received. Ladies and gentlemen, I must apologize to you for the imperfect character of these observations, which I have been obliged to condense as much as possible, as my time, and I dare say yours, is extremely limited. I only hope that any omissions which I have made will be supplied by my friends who are on each side of me.

Sir H. Roscoe, M.P., presented the report of the work of the Association during the past year. He said that there was no doubt that during the year a very great expansion of the work of the Association had been seen under both the Acts of Parliament to which reference had been made by the Chairman. The spread of technical education throughout the country had been most remarkable. From what had already been said by Lord Hartington, it would be concluded that practically the whole of England had devoted the whole of the money to technical instruction. The effects of this could scarcely be over-estimated. The only two places where the money had been devoted to the relief of the rates were, he regretted to say, London and Middlesex. But it should be borne in mind that what had been already accomplished was nothing to what remained to be done. The County Councils were as yet only breaking the ground. Their efforts were merely tentative. They had, as it were, to work out their own salvation in this matter of education, and there was certain to be at no great distance of time an Intermediate Education Act for England. Referring to the Act of 1891, he said that it was important and valuable because it enabled a County Council to go out of its own district if it thought necessary to promote technical education. Under that Act, for instance, the three Ridings of Yorkshire had been able to vote money to assist the Yorkshire College in its scheme for the improvement of agricultural education. Many of the County Councils had already appointed organizing secretaries, and it was on these that the main part of the work would fall. To them they had to look for the special organization of each particular district, and the importance of their work could scarcely be overrated. Then in the county boroughs the work was being got into shape. In Sheffield a sum of £8495 had been appropriated towards assisting institutions giving technical and secondary education. In the same way in Manchester £10,200 had been devoted to a like purpose. Agricultural education was making rapid progress, and already in Yorkshire, Durham, and Wales there was the nucleus of high class agricultural colleges. After referring to the necessity of some part of the money being devoted to the technical instruction of girls, he concluded by expressing the hope that the Association would be placed in a position by an increase of its resources to carry on actively a work that was daily becoming more important and more costly.

On the motion of Mr. H. Hobhouse, M.P., seconded by Lord Thring, the report was unanimously adopted.

Lord Hartington at this point left the chair, which was taken by Sir Bernhard Samuelson.

Lord Monteagle moved the reappointment of the vice-president, executive committee, and officers of the Association, the name of Mr. Bryce, M.P., being substituted for that of the late Earl Granville. Dr. Gladstone seconded, and Mr. Snape supported, the motion, which was carried unanimously.

Mr. Bryce, M.P., proposed the following resolution:—

"That this Association heartily congratulates the County Councils of England and Wales on the great progress they have made during the past year in the promotion of education in their districts, and earnestly trusts that they will continue to work until the country is provided with an organized system of secondary and technical education."

Miss Hadland seconded the resolution, which was agreed to.

Sir John Lubbock, M.P., proposed, and Mr. Rathbone, M.P., seconded, a vote of thanks to the Chairman, and this having been heartily accorded was acknowledged by Sir Bernhard Samuelson.

The proceedings then terminated.

SCIENTIFIC SERIALS.

In the *Journal of Botany* for May, Prof. R. J. Harvey-Gibson has an interesting article, illustrated, on the histology of *Polysiphonia fastigiata*. In the June number, Mr. A. W. Bennett contributes a short paper on sexuality among the Conjugatæ. These numbers also contain continuations of Mr. E. G. Baker's synopsis of the genera and species of Malveæ, and of the Rev. H. G. Jameson's useful key to the genera and species of British mosses.

THE papers in the *Botanical Gazette* for April and May are concerned almost exclusively with American botany. Mr. D. M. Mottier has an interesting note on the apical growth of Hepaticæ, which bears such a striking resemblance to that of the prothallium of ferns.

THE number of the *Nuovo Giornale Botanico Italiano* for April is chiefly occupied by papers of special interest to Italian botanists, and by the Bulletin of the Italian Botanical Society. Among the articles coming under the latter head is one by Sig. Baccarini on the secretory system of the Papilionaceæ, and one by Sig. Pichi containing an account of experiments on the parasitism of *Peronospora* on the vine.

THE *Botanical Magazine* of Tokyo still contains occasional articles in the English language. Those in the numbers most recently received, for March and April, relate to the native plants of Japan.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 11.—"A Study of the Planté Lead—Sulphuric Acid—Lead Peroxide Cell, from a Chemical Standpoint. Part I." By G. H. Robertson. Communicated by Prof. Armstrong, F.R.S.

The investigation, the results of which are recorded in this paper, was instituted about a year ago at the Central Institution, at Dr. Armstrong's suggestion, as McLeod's observations on the electrolysis of sulphuric acid solutions led to the supposition that the changes occurring in the acid were probably less simple than was commonly supposed. This supposition was verified.

The first section of the paper deals with the nature of the lead salt formed during discharge. Experiments made on various samples of red lead of different percentage composition showed that, as with nitric, so with sulphuric acid, it behaved like a mixture of peroxide and monoxide, the sulphate formed always corresponding to the monoxide originally present.

As analysis alone can give no proof of the existence of a definite homogeneous sulphate corresponding to red lead; evidence must be obtained that the product differs in some of its properties from a mixture. It was to be expected that the E.M.F. of an oxysulphate would differ from a corresponding mixture of sulphate and peroxide, and have some definite value, but experiments made with mixtures of sulphate and peroxide in different proportions, and with the product obtained by treating red lead with dilute sulphuric acid, showed that there was a difference of degree only between the red lead pastes and the mixtures.

With regard to Frankland's observations respecting the